UNDERGROUND HAULAGE.

BY J. S. MORRIS.

In traveling around the mines lately my attention has been drawn to the subject of underground haulage and the economy connected with it, and with the steadily increasing demand for coal for purposes of industry, deep mining becomes more and more necessary. This is true not only in those regions where coal occurs at great depths, and must be reached by sinking shafts, but also in the more favored localities where the seam crops out at the hill side, and the miner, following the strata, is compelled to penetrate for miles into the heart of the mountain, in all cases it is a question of great importance how to convey coal from the interior working rooms to the bottoms of the shafts, or directly to the surface, and from there to suitable shipping places, and it is probably not saying too much to assert that coal mining, considered as an industrial and commercial success, at the present day is principally dependent upon the methods by which this is done. It is easy to understand that sinking numerous shafts in developing mining properties must be expensive and inconvenient, and that it is preferable to transport the coal

underground, even great distances, to one centrally located shaft, if this can be done quickly and economically, this is fully demonstrated in the deep mines of England and Wales and the European continent, where for the last twenty-five years the underground haulage of coal by machinery has superceded the old methods, the coal extending over a field of several square miles is now conveyed to the surface through a single deep shaft cheaper and in less time than formally, where the coal could be mined near the surface, through a number of shallow shafts placed only a short distance, say a thousand feet from each other. Moreover the superior machinery for hauling, hoisting and pumping makes it possible to locate this shaft either in the deepest or any other part of the mine, wherever it is most advantagous for draining the water or landing the coal, for instance, in the town of Tredegar, South Wales, where I spent my boyhood days in the mines, trapping, driving, and mining, thirty-five years ago, there used to be seven shafts in the radius of two miles where coal and iron ore were hoisted out, and one hundred and fifty horses and drivers employed to bring this product to the bottom of those shafts, but for several years past there has been a large shaft sunk near the basin of this field and all coals brought to this deep shaft is by the use of wire ropes attached to machinery, and by this improvement two-thirds of those horses and drivers are dispensed with, and cost of coal taken from those mines been materially reduced by this system of underground haulage. In the Monongahela and Ohio coal regions of this country, the usual methods of mining is by horizontal or slightly dipping entries, and in the anthracite region by slopes and gangways through which the coal is brought to the surface by aid of machinery, and also in several mines in our own State extensive appliances of machinery have been made and I believe it is only a question of comparatively short time when manual and animal labor, as used for transporting will be changed, to be performed by machinery. If we consider that as recently as half a century ago. most of the hoisting ont of shafts was done by horses and gins, and after that period by water and was termed balance pits. There was constructed under the cage a large boiler that would hold enough water with the weight of an empty car to counter balance the loaded car on the bottom and bring it up to the surface, after which the water would be let out of this boiler into a large sump constructed expressly to hold this water, when it would be pumped out by a large engine. We remember those balance pits well, and have gone down and up them hundreds of times, but now they are done away with and machinery worked by steam has taken their places, showing plainly the immense advantages of modern progress in the perfection of machinery, with which now more coal is brought to the surface of the earth in one day, than half a century ago was brought in one year. The many methods in mining regions for transporting coal by means of wire rope, though varying from each other in detail, can be grouped in five distinct classes:

1. The self-acting or gravity in-

cline plane; this is gravity and only can be used to convey coal from a higher to a lower point, where the loaded cars in descending bring the empty cars to the level, such as we can see most any place along the Ohio river, between Steubenville and Bellaire.

2. The single engine plane which is used to take coal or other mineral from mines through slopes.

3. The tail rope system of all methods for conveying coal underground by wire rope. The tail rope system has justly found the most applicatiou, it can be applied under almost any condition; the roads may be straight or curved, level or undulating, in one continuous line or with side branches—in all cases this system works with equal certainty and economy.

4. The endless rope system, the princpal feature of this system are as follows: The rope of this name is endless. Second, motion is given to the rope by a single wheel or drum, and friction obtained either by a grip wheel or by passing the rope several times around the wheel. The rope must be kept constantly tight, the tension to be produced by artificial means. A few weeks ago I visited the Shawnee Valley mines, owned and operated by the Shawnee Valley Coal Company. Here we have one of the finest plants in the State, of the endless rope system. The engine is set near the pit mouth or mine entrance. The entry where the rope now works is one mile in length, with seven curves, the heaviest 37 degrees; this is a reversed curve and comes back to the same tangent. The grade at this point is three feet to the one hundred. They are at present preparing to extend the rope seven feet further on to the workings. They will right here have a curve of 45 degrees, or in other words, make a right angle going from the faces of the coal to the butts of the coal. Previous to the erection of this plant it took fourteen mules and as many drivers to get an out-put of five hundred tons daily; since this improvement has been made the same number of mules and drivers get an out-put of one thousand tons per day. This was completed four years ago, and if this improvement had not been made, and the mine extended at the same ratio it would at this time take 25 mules and as many drivers to get an out-put of 500 tons; showing plainly the superiority of machinery to manual and animal labor. The old veteran mine superintendent, Thomas Phillips, has charge of this mine, and he has everything working like a charm. Again, we have the same kind of a plant at the State line mine; this plane is 1½ mile long, their out-put is 1000 tons per day, when working full. The running speed of those two places is about ten miles per hour. We have another plant of the same style working successfully at the Monarch Mine, Dennison, Tuscarawas county. The length of this rope is three-fourths of a mile; they make a round trip here of twenty-five cars of 2000 pounds each, which would be twenty-five tons in sixteen minutes, and they calculate that they save sixteen mules by this rope in the amount of their out-put.

The 5th is the wire rope tramways, and are used exclusively and belongs to over-ground haulage, therefore I shall refrain from saying anything on the subject at present.